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STUDY OF LOW LAND RICE WEEDER AND DEVELOPMENT OF FING CUTTING ATTACHMENTS

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ABSTRACT

Direct weeding of sprouted rice in peddle soil, alternative to transplanting of weeding offers the advantages of the faster and earlier operation with reduce labour and therefore results into higher traditionally farmer practice manual broadcasting of spouted weed. Manual rice weeder development by researchers are been popularized to address the issue of the timelines and reducing drudgery in manual operation to proved an alternative to cutting of weed the design and development of rotary and development of rotary cutting mechanism was taken up.

Drum with fins cutting different size were design for field testing. A test setup and very the pressure the weeder. The drawings of various components and assemblies of were prepared utilizing CAD facilities and fabrication of components was done as per the drawing in the researcher work of Central Institute of Agricultural Engineering, Bhopal.

The field studies were conducted with different thrust on weeder. The variation in weed cutting rate dependent on quality of weeds in the field, thrust o weeder, water holding capacity of soil etc. 50 mm Dia. Drum was selected for the field testing on the CIAE Bhopal rice ridge seeder the performance of the weeding device was found to be satisfactory in the field if about 50 sg m. a weeding efficiency of about cutting for weed with average sprouted length of weeds 21 cm. weeding mechanism on the sprouted wedding on manual, animal and power operated can be taken up.

KEYWORDS: Manual Rice Weeder, Weeding

INTRODUCTION

Rice is a stable food of India. It is cultivated in 44.36 million hectare which account for nearly 37.0 percent of the gross cropped area of the country with total production of 84.87 million tone (2001) giving average yield of 1913 kg/ha. (Anonymous 2000-01). In cg and mp rice area contributes 3.6 and 1.67 million ha. with total production of 3.24 and 0.96 million tone giving average productivity of 900 and 1574 kg/ha respectively much less than average production in India. The average low productivity of rice in C.G. may be attributed to several factors in adequate weed control measure is one of the measure cause of low yield of rice especially direct seeded condition. The paddy is cultivated in direct field topo situation from upland to extreme low land. The area under upper midland is about 25 percent at total paddy area; the weeding in this condition is very difficult.

Weeds are unwanted and undesirable plants which interfere and compete with main crop for utilization of land, nutrients, and sun light and water resources. The growth of weeds is generally vigorous and causes loss of yield to the tone of 75 percent. For rice the loss of production has been reported 40 percent. According to Singh (1996) weeds was the

measure agency which causes 33 percent of yield loss in terms of pest against 26 percent, 26 and 15 percent losses by disease, insects and birds respectively.

Control of paddy weeds in Indonesia is mainly carried out manually, or semi-mechanically using rotary weeders However, some farmers are using herbicides to control weeds both for land preparation (in tidal swamp rice systems), and to control weeds after planting.

Chemical methods, flaming, hand weeding and mechanical weeding. In India, formers mainly followed hand weeding. Application of chemicals is practiced to limited extent. Use of herbicides is expensive and so residual effects affect the soil health and quality of produce. Flaming produce intensive heat and required more expensive equipments for applications. Hand weeding requires more labor and time leading to higher cost of weeding. Due to scarcity of labors during peak season mechanical weeding and enter cultivation using improved implements are being practiced in wider crops

Weed control measure are older, cultural, mechanical and chemical methods with their relative advantages and dis-advantages. Hand hoe is commonly preferred by formers in rice because of limitation of narrow row space. In rain fed rice since the seasonal weed posses relatively higher growth rate at the initial stage of establishment of crop which try to suppress the crop under dry friable condition of soil and manual dry land weeds consumes more time and energy therefore, or higher rate weeding in rice within limited period of weeding time. The objectives of the thesis research are as follows – Design and fabrication of hand weeders with rotary blade attachments. Testing and evaluation of equipments to assess it functional performance. Pandey (1983) reported that weeding treatment was superior to chemical methods of weed control in direct seeded upland rice. Biswas (1984) rewired the common weeds of Bhopal reason. Those are classified on the basis of occurrence/harbites duration of life and plant family. Mambani, et al (1989) Tillage effects on four lowland soils were evaluated and the relationship between climatic water balance (W= difference between cumulative rainfall and evaporation) and rice (Oryza *sativa L.* var. IR20) response to land preparation was determined under rain fed conditions. Tillage treatments included zero tillage, roto tilling, conventional plowing, shallow paddling and thorough paddling. Sogaard (1998), in anger weeder, efficiency of weeding treatment depends upon the state of the soil.the study effect of variation of soil condition on weeding efficiency, a pilot project was carried out in 1995 to study the prospect of using sensor/control technology. The reduction of weed control variation could be attained by controlling the tine angle with reference to the working depth measurements. Anger weeder was outfitted with a sensor (control) for measurement of the working depth, and the signal generated from the sensor was processed to a control system. The control system of sensor used to adjust the working depth with the help of adjusting the angle of the harrow tines and help to minimize variations in weed covering by soil. Experiments carried out with Owed plants expressed a direct correlation between the weed covering achieved and working depth. Previously, Tewari et al (1991**)** considering the mechanical and ergonomics considerations with field trials. To evaluate the physiological response with varying load and environmental conditions, laboratory tests were carried out in a psychometric chamber. The correlation between oxygen consumption rate and energy expenditure rate against heart rate of operator were ascertained. During testing, field tests were conducted with the three weeders with Arhar crop in a farm at average ambient temperature (36°C) and relative humidity (82%). The indigenous tools for weeding viz. 'khurpi', spade and improved tool (3-tine hoe) is considered for moderately heavy work in field operation. By considering the energy requirement, a 'khurpi' requires less energy as compared to the 3-tine hoe and spade. Also, 'khurpi'

considered to be more contented with comparison to the standing posture (about 145°) erect position for the 3-tine hoe, and then standing posture (about 108°) erect position with the spade

MATERIALS AND METHODS

The material and methods adopted for design, fabrication, testing and evolution of Japanese weeder for weeding and inter-cultivation operation for row seeded rice have been described in this chapter. The machine design using CAD software and fabricated in the research workshop in CIAE Bhopal. The selection of material was generally made as per…

Design Consideration

- The machine may be simple easy to operate and easy to maintain.
- It may be modular structure with provision for assembly and dismantling.
- The machine may have operational safety ergonomically sound and should adequate strength and durability of components.
- The spares used should be easily available and manufacturing processes may be simple.
- The design may ensure higher output at reduced cost of operation and suitable for weeding operation in narrow row spaced rice with higher weeding efficiency at low plant mortality.

Design of Components

Components of Japanese weeder

- Rollers
- Float
- Main Frame
- Handle
- Supporting plates
- Fingers

The components of Japanese weeder are designed and fabricated by following standard processes. Japanese weeders consists 3 mm thick M.S. sheet of 10 gauges is used because it is corrosion resistance, heat resistance, as well as wear resistance which transmitters' total thrust through the handle from the rollers. Roller the roller of 50 mm dia. made up of 10 gauge M.S. sheet (3 mm thick) consists arrangement of fings into specific manner. The roller is divided into six equal parts and row of each equal part consist two and three numbers of fings respectively arrange in alternative rows. Combination of two rollers with respect to float leads the weeding processes. At the inner part of roller consist a bush and nut arrangement which reduces the friction between nut and the roller, also avoids the direct contact of nut and roller shown in figure 1.

Performance Test

The weeder was tested under actual field condition for performance evaluation. The performance of Japanese weeder was compared to the performance of manually operated cono weeder. One treatment of without weeding was also

taken for comparison. The Japanese weeder was field tested in row seeded rice for its mechanical and weeding performance. The size of field was 10x5 meter sown in figure 2.

Following observation were taken during weeding operation:

- The row to row distance is 35 cm.
- The height of water into the field is 5.4 cm.
- Weeds height 21 cm.

Figure 1: Operation Performed during Fabrication

Speed of Operation

The speed of operation (kmph) was calculated by measuring the mean time required (sec) to cover 10 m distance in the field.

$$\text{Speed (kmph)} = \text{distance travelled (m)} / \text{time (s)}$$

$$\text{Weeding efficiency (n)} = \frac{\text{weed count before weeding} - \text{weed count after weeding}}{\text{weed count before weeding}}$$

Figure 2: Performance of Weeding Operation

Performance and Evaluation

- Weeder type Japanese weeder

- Total area (m^2) 50
- Plant population/m^2 70
- Raw spacing (cm) 40.23
- Ave. plant height (cm) 40
- Depth of water 64
- Avenge. Weed height (cm)1
- Before weeding
- Weed count/m2 196
- Total no. of weeds (50 m^2)9800
- After weeding
- Weed count/m^2 59
- Total no of weeds (50 m^2) 2950
- Total no. of cutting weeds 9800-2950=6850
- Time taken for 10 m weeding 1.23 min
- Time taken for 1 ha51.25 hr
- Speed in km/hr 2.05
- Weeding efficiency 69.89%

RESULTS AND DISCUSSIONS

The weeding through Japanese weeder (manually operated) is easy as compared to cono weeder. The use of manually operated weeder is depend upon the foiling factors

- Availability of manual weeder.
- Cost of weeder.
- Efficiency of weeder.
- Its maintenance.
- Thrust exerted on the weeder during the weeding.
- Handling.
- Production area (either it is low land or up land).

A good weeder consists of above considerations. If a weeder not satisfies above consideration, the weeder is not successful in design. The tables which show the comparison of different weeder helps to choose the weeder with respect to

above consideration. Japanese weeder provides high efficiency as compared to cono weeder as well as it is to operate and maintenance.

Table 1: Shows Comparison between Different Weeding Devices

S. no	Treatment	Weed Density before Weeding Per m^2	Weed Density after Weeding per m^2	Weeding Efficiency (%)
1.	Power rotary weeder	264	79	70.1
2.	Biasi tool attachment	238	91	61.8
3.	Cono weeder	242	85	64.9
4.	Japanese weeder	196	59	69.89

SUMMARY AND CONCLUSIONS

Design and development of Japanese weeder for weeding and inter cultivation in row seeded rice was taken up. In rain fed rice since the seasonal weeds pose relatively higher growth rate at the initial stage of establishment of crop those try to suppress and affected the performance of crop. Further under dry friable condition of soil the manual hand hoe weeding being slow causes high plant mortality of crops plants due to moisture stress and wilting.

Design dimensions of Japanese weeder were workout and drawings are prepared. The machine was fabricated in prototype production centre at CIAE, Bhopal by following the standard manufacturing process. The machine consists of frame, roller with fingers attachment, handle, float and supporting plates. The working width is 200 mm and weight of Japanese weeder is 10.8 Kg

Based on the performance of Japanese weeder in row-seeded rice (spacing 250 mm) at 25 DAS following conclusion were drum: The Japanese weeder was found suitable for weeding in row space of rice limited to 50 mm depth under dry friable condition of soil. Weeding efficiency. Plant damage. With flow attachment, it is being suitable for weeding in wet soil condition. Weeding efficiency. Plant damage. The Japanese weeder with roller and float attachment use 69.89% of weeding efficiency which is higher than the weeding efficiency of cono-weeder which is 64.43. The weeding speed slightly higher than the cono-weeder which is 0.04 and the speed of Japanese weeder 0.05 m/sec. Therefore, for faster and finely weeding in row-seeded rice the Japanese weeder was considered to be appropriate for medium scale weeding.

REFERENCES

1. Biswas,H.S. 1980. Weeding tools and implements of India. Technical bulletin no., CIAE/78/3, Central institute of agriculture engineering, Bhopal, India.
2. Biswas, H.S. 1984. Weed control techniques. CIAE Technical bulletin no. CIAE/84/46.
3. Patel,C.S. and Pandey,H.K.1983. Weed control equipment in rice based cropping system-rice abstract, 6(12):306.
4. H. T. Sogaard 1998 Automatic Control of a Finger Weeder with Respect to the Harrowing Intensity at Varying Soil Structures. Research Centre Bygholm, Box 536, DK-8700 Horsens, Denmark. J. agric. Engng Res. (1998) 70, 157Ð163 Article Number: ag970260

5. Mambani, B., De Datta, S.K. and Redulla, C.A., 1989. Land preparation requirements for rain fed Rice as affected by climatic water balance and tillage properties of lowland soils. Soil Tillage Res., 14: 219-230.
6. V.K. Tewari*, R.K. Datta t and A.S.R. Murthy 1991 Evaluation of three manually operated weeding devices. Professor, Reliability Engineering Centre; all at the Indian Institute of Technology, Kharagpur (WB), India. Applied Ergonomics 1991, 22.2, 111-11